LinMot®

C1400 Servo Drives
Installation Guide

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1 Important Safety Instructions

For your personal safety
Disregarding the following safety measures can lead to severe injury to persons and damage to material:

- Only use the product as directed.
- Never commission the product in the event of visible damage.
- Never commission the product before assembly has been completed.
- Do not carry out any technical changes on the product.
- Only use the accessories approved for the product.
- Only use original spare parts from LinMot.
- Observe all regulations for the prevention of accidents, directives and laws applicable on site.
- Transport, installation, commissioning and maintenance work must only be carried out by qualified personnel.
    - Observe IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and all national regulations for the prevention of accidents.
    - According to the basic safety information, qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.
- Observe all specifications in this documentation.
    - This is the condition for safe and trouble−free operation and the achievement of the specified product features.
    - The procedural notes and circuit details described in this documentation are only proposals. It is up to the user to check whether they can be transferred to the particular applications. NTI AG / LinMot does not accept any liability for the suitability of the procedures and circuit proposals described.
- LinMot servo drives and the accessory components can include live and moving parts (depending on their type of protection) during operation. Surfaces can be hot.
    - Non−authorized removal of the required cover, inappropriate use, incorrect installation or operation create the risk of severe injury to persons or damage to material assets.
    - For more information, please see the documentation.
- High amounts of energy are produced in the drive. Therefore it is required to wear personal protective equipment (body protection, headgear, eye protection, hand guard).

Application as directed

- Drives are components which are designed for installation in electrical systems or machines. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000−3−2.
- When drives are installed into machines, commissioning (i.e. starting of the operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 98/37/EC (Machinery Directive); EN 60204 must be observed.
- Commissioning (i.e. starting of the operation as directed) is only allowed when there is compliance with the EMC Directive (2004/108/EC).
- The technical data and supply conditions can be obtained from the nameplate and the documentation. They must be strictly observed.

Transport, storage

- Please observe the notes on transport, storage, and appropriate handling.
- Observe the climatic conditions according to the technical data.

Installation

- The drives must be installed and cooled according to the instructions given in the corresponding documentation.
- The ambient air must not exceed degree of pollution 2 according to EN 61800−5−1.
- Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.
- Drives contain electrostatic sensitive devices which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

- When working on live drives, observe the applicable national regulations for the prevention of accidents.
- The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross−sections, fuses, PE connection). Additional information can be obtained from the documentation.

- This product can cause high-frequency interferences in non industrial environments which can require measures for interference suppression.

Operation

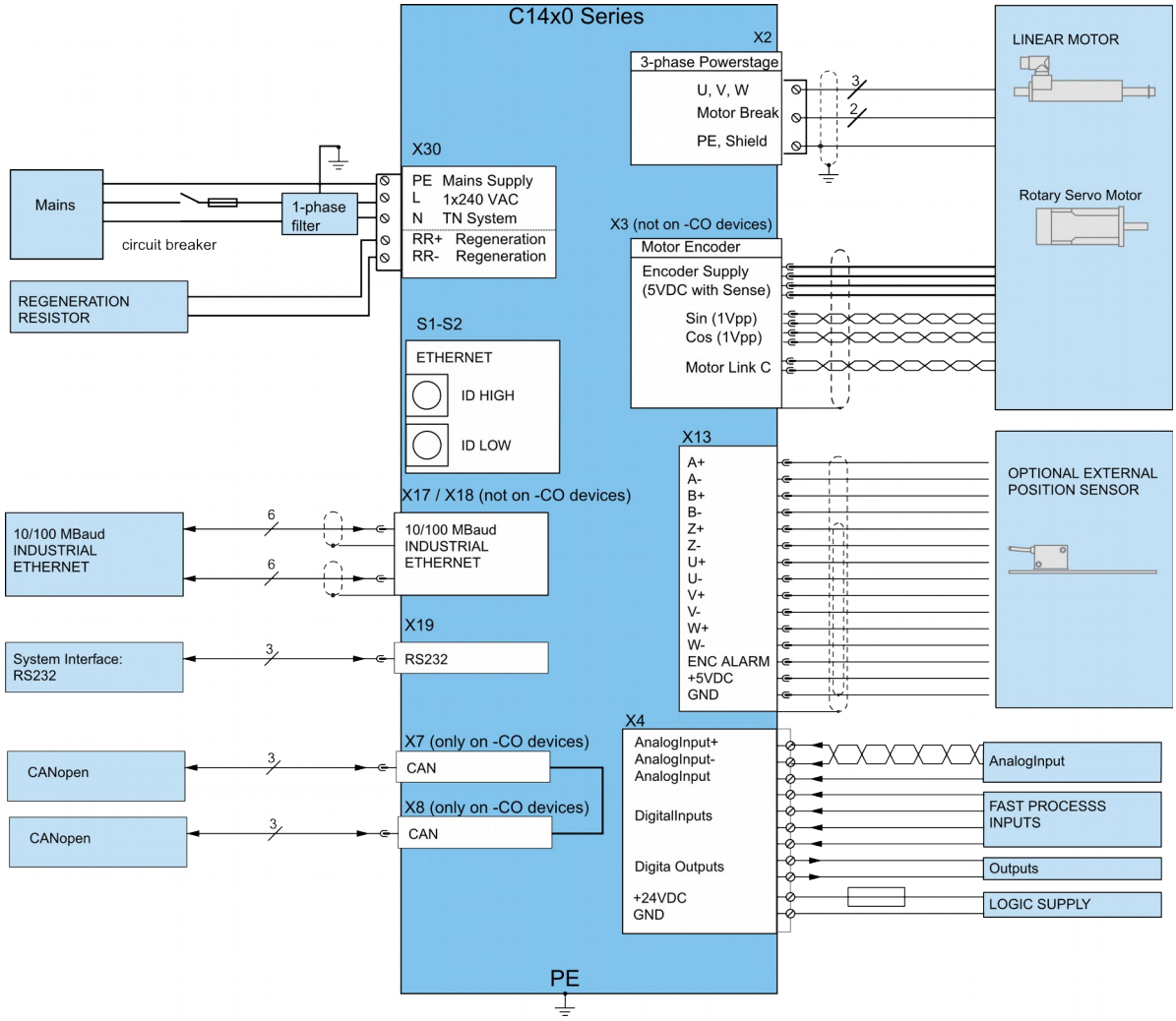
- If necessary, systems including drives must be equipped with additional monitoring and protection devices according to the valid safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents). The drives can be adapted to your application. Please observe the corresponding information given in the documentation.
- After the drive has been disconnected from the supply voltage, all live components and power connections must not be touched immediately because capacitors can still be charged. Please observe the corresponding stickers on the drive. All protection covers and doors must be shut during operation.

Protection of persons

- Before working on the drive, check that no voltage is applied to the power terminals:
  - The power terminals U, V, W, DC+, DC-, RR+, and RR- remain live for at least 5 minutes after disconnecting from mains.
  - The power terminals L1, L2, L3; U, V, W, KTY+, KTY-, DC+, DC-, RR+ and RR- remain live when the motor is stopped.
- The leakage current to earth (PE) is >3.5 mA. According to EN 50178 a fixed installation is required and a double PE connection is required.

- The heat sink of the drive has an operating temperature of > 80 °C: Contact with the heat sink results in burns.

2 System Overview



3 Functionality and Interfaces

	C1450-PN-VS-0S-000	C1450-PD-VS-0S-000	C1450-SC-VS-0S-000	C1450-IP-VS-0S-000	C1450-LU-VS-0S-000	C1450-EC-VS-0S-000	C1450-DS-VS-0S-000	C1450-SE-VS-0S-000	C1450-PL-QN-0S-000	C1400-CO-VS-0S-I03
Supply Voltage										
Motor Supply 1x240 VAC	●	●	●	●	●	●	●	●	●	●
Logic Supply 24VDC (22...26VDC)	●	●	●	●	●	●	●	●	●	●
Motor Phase Current (preliminary)										
15 $A_{rms\ peak}$ (0-500Hz)	●	●	●	●	●	●	●	●	●	●
7.5 $A_{rms\ continuous}$ (0-500Hz) (preliminary)[1]	●	●	●	●	●	●	●	●	●	●
Controllable Motors										
LinMot P10-70x…(Motor Link C)	●	●	●	●	●	●	●	●	●	
Selected motors (contact support)	●	●	●	●	●	●	●	●	●	●
Command Interface										
PROFINET	●									
PROFINET Profidrive		●								
SERCOS III			●							
ETHERNET IP				●						
LinUDP					●					
ETHERCAT						●				
ETHERCAT CiA402							●			
ETHERCAT SoE								●		
POWERLINK									●	
CANopen										●
Programmable Motion Profiles (Curves)										
Up to 100 Motion Profiles Up to 16302 Curve Points	●	●	●	●	●	●	●	●	●	●
Programmable Command Table										
Command Table with up to 255 entries	●	●	●	●	●	●	●	●	●	●
External Position Sensor										
Incremental (RS422 up to 25 M counts/s)	●	●	●	●	●	●	●	●	●	●
Absolute (SSI)	●	●	●	●	●	●	●	●	●	●
Configuration Interface										
RS232	●	●	●	●	●	●	●	●	●	●

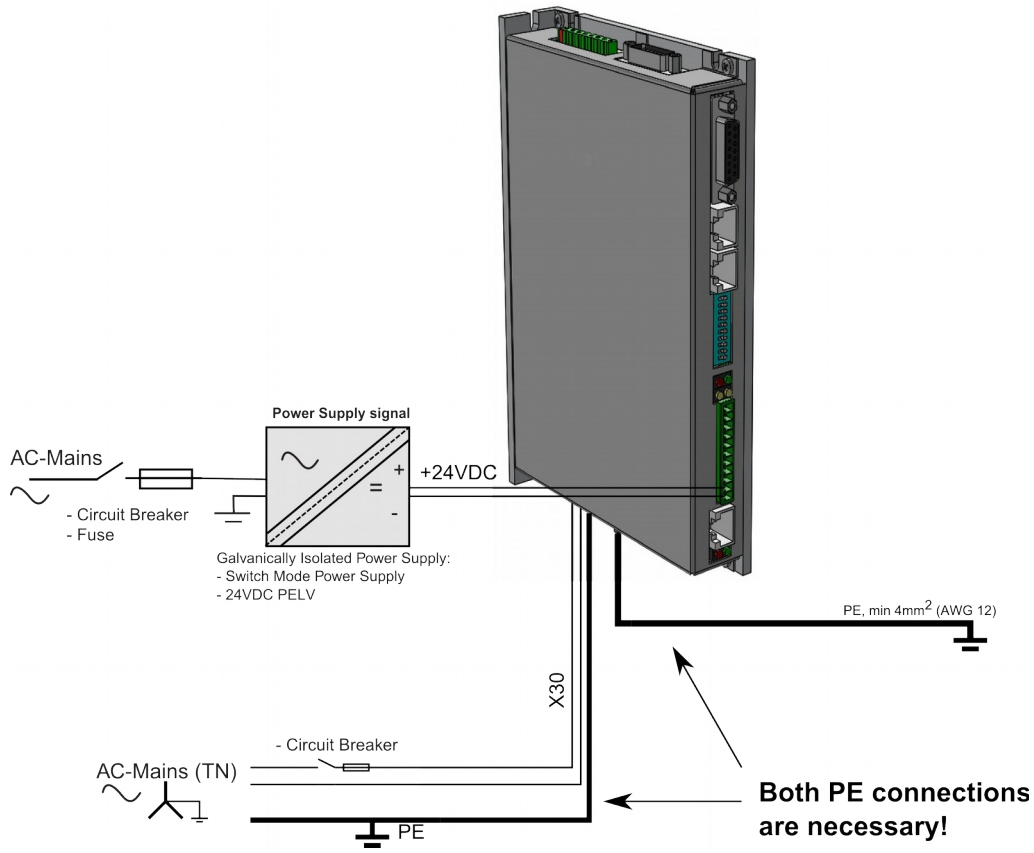
1Additional cooling and/or heat sink may be required to achieve rated performance

4 Power Supply and Grounding

In order to assure a safe and error free operation, and to avoid severe damage to system components, **all system components must be well grounded to protective earth PE.** This includes both LinMot and all other control system components on the same ground bus.

The leakage current to earth (PE) is >3.5 mA. According to EN 50178 a fixed installation is required and **a double PE connection is required**. One PE connection is on X30, the second one is an M5 bolt on top of the housing.

Each system component should be tied directly to the ground bus **(star pattern**), rather than daisy chaining from component to component. (LinMot motors are properly grounded through their power cables when connected to LinMot drives.)

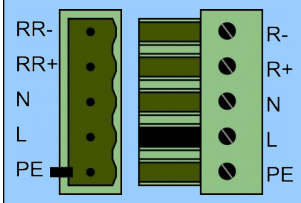


5 Description of the connectors / Interfaces

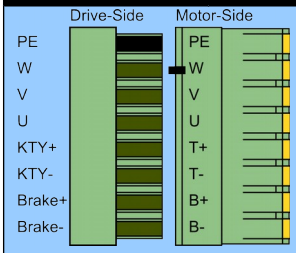
5.1 PE

PE	Protective Earth
PE	• Use min. 4mm² (AWG11) • Tightening torque: 2Nm (18 lbin)

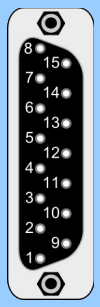
5.2 X30

X30	Motor Supply Mains / Regeneration
	RR- Regeneration Resistor RR+ Regeneration Resistor N: Neutral (TN system with grounded Neutral) L1: Line 1 (1x240VAC (+-10%) 50/60Hz external fuse: max.10A) PE: PE, Protective Earth
Screw connector	Screw Terminals: - Tightening torque: 0.5 - 0.6 Nm - Screws: M3 - Use 60/75°C copper conductors only - Conductor cross-section: 2.5mm² (AWG 12) - Stripping length 7mm **LinMot Article Number: 0150-3607 (DC01-C1400/X30)** **Operating of the drive is only allowed with the above article!** **No other type of connector shall be used!**

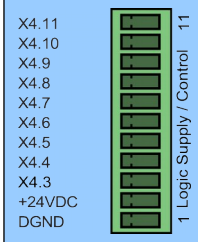
5.3 X2

X2	Motor Phases
	PE: Protective Earth W: Motor Phase W V: Motor Phase V U: Motor Phase U T+: Temperature Sensor KTY+ T-: Temperature Sensor KTY- B+: Motor Brake+ B-: Motor Brake-
Spring Cage Connector	**The Shield of the motor cable has to be mounted with a surface as large as possible (low ohm, low impedance). Use an EMC shield clamp for fixing.** **Attention:** **An isolated thermistor is necessary! Especially LinMot D01 and D02 Motors can not be connected!** Screw Terminals: - Spring-cage connector - Use 60/75°C copper conductors only - Conductor cross-section: 0.2 – 2.5 mm^2 (depends on Motor current) / AWG 24 -12 - Stripping length 10mm **LinMot Article Number: 0150-3605** **Operating of the drive is only allowed with the above article!** **No other type of connector shall be used!**

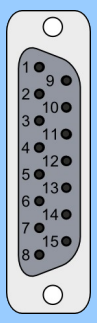
5.4 X3

X3	Motor Encoder (Motor Link C) / Not available on -CO drives!	
	8 15 7 14 6 13 5 12 4 11 3 10 2 9 1 case	Motor Link C - Motor Link C + do not connect do not connect do not connect do not connect GND do not connect GND Sense +5V Sense Cos- Cos+ Sin- Sin+ +5V shield
DSUB-15 (m)	Motor Link C is a high speed serial communication protocol to the motor encoder.	

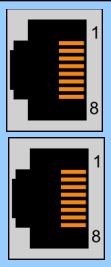
5.5 X4

X4	Logig Supply / IO Connection		
	11 10 9 8 7 6 5 4 3 2 1	AnIn- X4.11 AnIn+ X4.10 AnIn X4.9 In X4.8 In X4.7 In X4.6 In X4.5 Out X4.4 Out X4.3 +24VDC Supply GND Supply	Configurable Analog Input differentiell (with X4.10) Configurable Analog Input differentiell (with X4.11) Configurable Analog Input single ended Configurable Input Configurable Input Configurable Input Configurable Input Configurable Output Configurable Output Logic Supply 22-26 VDC Ground
Spring cage connector	Inputs (X4.5 .. X4.8): 24V / 5mA (Low Level: –0.5 to 5VDC, High Level: 15 to 30VDC) Outputs (X4.3 .. X4.4): 24V / max.100mA, Peak 370mA (will shut down if exceeded) Analog Inputs: 12 bit A/D converted X4.9: Single ended analog input to GND, 0..10V, Input Resistance 51kOhm to GND X4.10/X4.11 Differential analog input, +/-10V, Common mode range +/- 5VDC to GND Input resistance 11.4kOhm for each signal to GND. Supply 24V / type. 1A / max. 2.5A (if all outputs “on” with max. load.) - Use 60/75°C copper conductors only - Conductor cross-section max. 1.5mm^2 - Stripping length: 10mm **LinMot Article Number: 0150-3447 (DC01-Signal/X4)** **Operating of the drive is only allowed with the above article!** **No other type of connector shall be used!**		

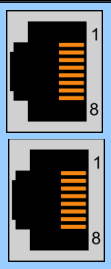
5.6 X13

X13	External Position Sensor Differential Hall Switches	
	1 9 2 10 3 11 4 12 5 13 6 14 7 15 8 case	+5V DC A+ A- B+ B- Z+ Z- Encoder Alarm GND U+ U- V+ V- W+ W- Shield
DSUB-15 (f)	<u>Position Encoder Inputs (RS422):</u> Max Input Frequency: 25 M counts/s with quadrature decoding, 40ns edge separation <u>Encoder Simulation Outputs (RS422):</u> Max Output Frequency: 4 M counts/s with quadrature decoding, 250ns edge separation <u>Differential Hall Switch Inputs (RS422):</u> Input Frequency: <1kHz <u>Enc. Alarm In:</u> 5V / 1mA <u>Sensor Supply:</u> 5VDC max. 100mA / 9VDC 100mA (SW selectable)	

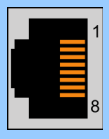
5.7 X17 - X18

X17 - X18	RealTime Ethernet 10/100 Mbit/s (not available on -CO Drives)	
	X18 RT ETH Out X17 RT ETH In	Specification depends on RT-Bus Type. Please refer to according documentation.
RJ-45		

5.8 X7 - X8

X17 - X18	CMD CAN (only available on -CO Drives)	
	1 2 3 4 5 6 7 8	Do not connect Do not connect Do not connect isolated GND isolated GND Do not connect isolated CAN high isolated CAN low Optically isolated CAN Bus.
RJ-45	use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring. The built in CAN terminations can be activated by S5.9. X7 is internally connected to X8 (Pin4, 5, 7 and 8)	

5.9 X19

X19	System	
	1 2 3 4 5 6 7 8	Do not connect Do not connect RS232 Rx GND GND RS232 Tx Do not connect Do not connect
RJ-45	Use **isolated USB-RS232 converter (Art.-No. 0150-2473)** for configuration over RS232.	

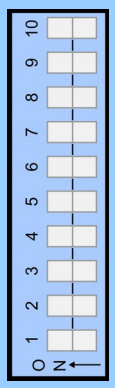
5.10 LEDs

LEDs	State Display	
	Green Yellow Yellow Red	24V Logic Supply OK Motor Enabled / Error Code Low Nibble Warning / Error Code High Nibble Error

5.11 RT BUS LEDs

RT Bus LEDs	RT Bus State Display	
	Green Red	OK Error
	The use of these LEDs depends on the type of fieldbus which is used. Please see the corresponding manual for further information.	

5.12 S1 - S2 - S5

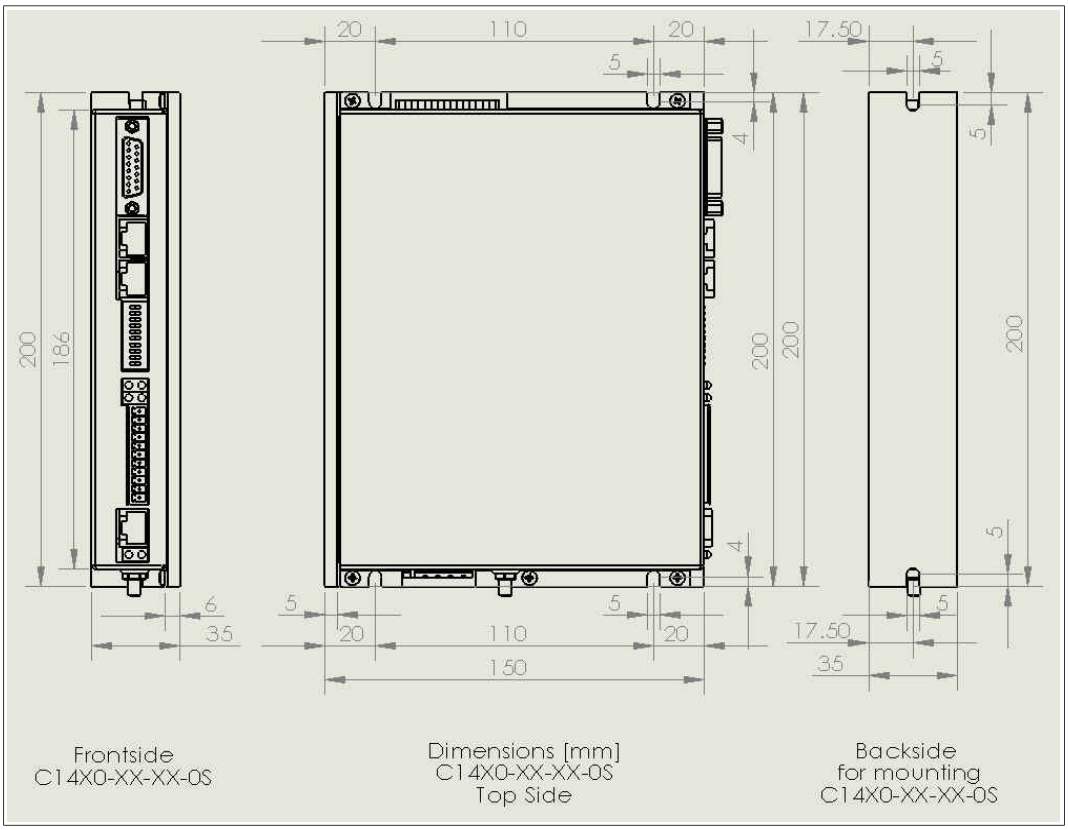
S1 - S2	Address Selectors	
	S5 (10) S5 (9) S1 (5..8) S2 (1..4)	Bootstrap: Must be off for normal operation CAN termination on CMD (120R between pin 7 and 8 on X7/X8) on/off Bus ID High (0 … F). Bit 5 is the LSB, bit 8 the MSB. Bus ID Low (0 … F). Bit 1 is the LSB, bit 4 the MSB.
	The use of these switches depends on the type of fieldbus which is used. Please see the corresponding manual for further information.	

6 Error Codes

Error Codes			
Error	**Warn**	**EN**	**Description**
Off	Warning	Operation Enabled	**Normal Operation:** Warnings and operation enabled are displayed.
On	● ~2Hz 0..15 x Error Code High Nibble	● ~2Hz 0..15 x Error Code Low Nibble	**Error**: The error code is shown by a blink code with “WARN” and “EN”. The error byte is divided into low and high nibble (= 4 bit). ”WARN” and “EN” are blinking together. The error can be acknowledged. (e.g.: WARN blinks 3x, EN blinks 2x; Error Code = 32h)
● ~2Hz	● ~2Hz 0..15 x Error Code High Nibble	● ~2Hz 0..15 x Error Code Low Nibble	**Fatal Error**: The error code is shown by a blink code with “WARN” and “EN”. The error byte is divided into low and high nibble. ”WARN” and “EN” are blinking together. Fatal errors can only be acknowledged by a reset or power cycle. (e.g.: WARN blinks 3x, EN blinks 2x; Error Code = 32h)
● ~4Hz	● ~2Hz 0..15 x Error Code High Nibble	● ~2Hz 0..15 x Error Code Low Nibble	**System Error:** Please reinstall firmware or contact support.
● ~0.5Hz	● ~0.5Hz	On	**Signal Supply 24V too low:** The error and warn LEDs blink alternating if the signal supply +24V (X4.2) is less than 18VDC.
Off	✳●●●	●✳●●	**Plug&Play Communication Active** This sequence (Warn on, then En on, then both off, complete sequence of the 4 states ca. 1Sec) signalizes the state when the plug and play parameters are being read from the motor.
✳● ~4Hz	●✳ ~4Hz	Off	**Waiting for Defaulting Parameters** When ID (S1, S2) is set to 0xFF, the drive starts up in a special mode and the Error and Warn LED blink alternating ~4Hz. When the ID ist set to 0x00, all parameters will be set to their default value. To leave this state, power down the drive and change the ID. Also see in the Usermanual_LinMot-Talk under chapter trouble shooting.
Off	✳● ~2Hz	✳● ~2Hz	**Defaulting Parameters Done** When the parameters have set to their default values (initiated via S1/S2 on power up) the Warn and En LEDs blink together at 2 Hz. To leave this state, power down thedrive. Also see in the Usermanual_LinMot-Talk under chapter trouble shooting.

The meaning of the error codes can be found in the Usermanual_MotionCtrl_Software_SG5 and the user manual of the installed interface software. These documents are provided together with LinMot-Talk configuration software and can be downloaded from *www.linmot.com*.

7 Physical Dimensions



***C1400 Series** single axis drive*		
Width	mm (in)	35 (1.38)
Height	mm (in)	200 (7.87)
Depth	mm (in)	219.5 (8.7)
Weight	kg (lb)	???
Mounting		2 x M4, Distance 192 (7.56)
Case	IP	20
Storage Temperature	°C	-25…40
Transport Temperature	°C	-25…70
Operating Temperature	°C	0…40
Relative humidity		95% (non-condensing)
Pollution	IEC/EN 60664-1	Pollution degree 2
Site altitude	m amsl	to be defined
Max. Case Temperature	°C	90
Max. Power Dissipation	W	100 Additional cooling and/or heat sink may be required to achieve rated performance
Mounting place		In the control cabinet
Mounting position		vertical
Distance between drives	mm (in)	≥ 15 (0.6) left and right ≥ 200 (8) top / bottom

8 Power Supply Requirements

Motor Power Supply

Direct AC mains connection: 1/PE AC 240V (±10%) / 50-60Hz / TN System

Only 1-phase supply is supported! The mains must be a symmetrical four-wire system with grounded neutral.

DC Supply (for example 72VDC) for initial test setups can be supplied through the 1-phase supply connector.

Use a circuit breaker C16 and conductor cross section of 2.5mm² for mains connections!

The LinMot line filter XXXX must be connected near the supply connector of the drive to conform to the EMC requirements of CE.

Signal Power Supply

The logic supply needs a regulated power supply of a nominal voltage of 24 VDC. The voltage must be between 22 and 26 VDC.

Current consumption:

min. 1A	(no load on the outputs)
typ. 1.5A	(all 10 outputs “on” with 100mA load and /Break with no load)
max. 2.5A	(all 10 outputs “on” with 100mA load and /Break with 1A load)

9 Regeneration of Power / Regeneration Resistor

There are two possibilities to deal with power regeneration:

Option A: DC Link coupling or additional Capacitors

Option B: Install a regeneration resistor to X1 (RR+ and RR-). The threshold value of the voltage depends on the used motor voltage power supply. The max. threshold value must not exceed 780 VDC.

Item	Description	Art. No.
Regeneration Resistor	RR01-68/100 (68 Ohm, 100 W, X1 connector is included)	0150-3373

10 Ordering Information

Item	Description	Art. No.
C1450-SE-VS-0S-000	EtherCAT SoE Drive (1x240V/20A)	0150-2634
C1450-SC-VS-0S-000	Sercos III Drive (1x240V/20A)	0150-2633
C1450-PN-VS-0S-000	ProfiNet Drive (1x240V/20A)	0150-2632
C1450-PL-VS-0S-000	POWERLINK Drive (1x240V/20A)	0150-2630
C1450-PD-VS-0S-000	PROFIdrive Drive (1x240V/20A)	0150-2635
C1450-IP-VS-0S-000	Ethernet/IP Drive (1x240V/20A)	0150-2612
C1450-EC-VS-0S-000	EtherCAT Drive (1x240V/20A)	0150-2631
C1450-DS-VS-0S-000	EtherCAT CoE Drive (1x240V/20A)	0150-2636
C1400-CO-VS-0S-I03	CANopen Drive (1x240V/20A) OEM only	0150-2637
Accessories	**Description**	**Art. No.**
Isolated USB-RS232 converter	**Isolated USB RS232 converter with config. cable**	**0150-2473**
RR01-68/100-C1400	Regeneration resistor (68R, 100W, 1000V) for C1400	0150-????
NF01-???	**1-phase line filter for C1400**	**0150-????**
DC01-C1400/X4/X30	**Drive Connector Set for C1400-0S**	**0150-????**
DC01-C1400/X2	Drive Connector Motor Phases	0150-3605
DC01-E1400/X4	Drive Connector 24VDC & Logic	0150-3447
DC01-C1400/X30	Drive Connector Mains Supply (1x240VAC)	0150-3607
MC10-EMV/14-D	Shield clamp for P10 motor power cable	0150-3631

Bold items are strongly recommended accessories!

ATTENTION: The connectors have to be ordered separately and are not included with the drive!
Use isolated USB RS232 converter for configuration!

11 International Certifications

Certifications	
Europe CE	See chapter “12 EC Declaration of Conformity CE-Marking“
UL	UL508C pending

ODVA
Networks Built on a Common Industrial Protocol

Declaration of Conformity to the EtherNet/IP™ Specification

ODVA hereby issues this Declaration of Conformity to *The EtherNet/IP™ Specification* for the product(s) described below. The Vendor listed below (the "Vendor") holds a valid Terms of Usage Agreement, which is incorporated herein by reference, for the EtherNet/IP Technology from ODVA, thereby agreeing that it is the Vendor's ultimate responsibility to assure that its EtherNet/IP Compliant Products conform to *The EtherNet/IP Specification* and that *The EtherNet/IP Specification* is provided by ODVA to the Vendor on an AS IS basis without warranty. NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE BEING PROVIDED BY ODVA.

In recognition of the below EtherNet/IP Compliant Product(s) having been EtherNet/IP Conformance Tested at ODVA-authorized Test Service Provider and having received a passing result from ODVA at the Composite Test Revision Level specified below, this Declaration of Conformity authorizes the Vendor to use the EtherNet/IP Certification Marks in conjunction with the specific EtherNet/IP Compliant Product(s) described below, for so long as the Vendor's Terms of Usage Agreement for the EtherNet/IP Technology remains valid.

EtherNet/IP conformance tested

Certification Logo Mark

EtherNet/IP CONFORMANCE TESTED ™

Certification Word Mark

This Declaration of Conformity is issued on February 2, 2015 on behalf of ODVA by:

Katherine Voss

Executive Director

Vendor Information	
Vendor Name	NTI Limited

Test Information	
Test Date	December 11, 2014
Composite Test Revision	CT11
ODVA File Number	11332.01

Product Information	**Network Category:**	**Node**
Identity Object Instance		
Vendor ID (Attribute 1)	589	
Device Type (Attribute 2)	0x2B	
Device Profile Name	Generic Device (keyable)	

Products Covered under this Declaration of Conformity (Identity Object Instance)

No.	Product Code (Attribute 3)	Product Name (Attribute 7)	Product Revision (Attribute 4)	SOC File Name
1	1886	C1250IPXC0S	1.001	C1250IPXC0S.stc
2	2346	C1250IPXC1S	1.001	C1250IPXC1S.stc
3	1761	E1250-IP-UC	1.001	Not Tested
4	1782	E1450IPQN0S	1.001	Not Tested
5	2354	E1450IPQN1S	1.001	Not Tested
6	2610	C1450IPQN0S	1.001	Not Tested
7	2611	C1450IPQN1S	1.001	Not Tested
8	2612	C1450IPQD0S	1.001	Not Tested
9	2613	D1450IPVR0S	1.001	Not Tested
10	2614	D1450IPQD0S	1.001	Not Tested
11	2615	D1250IPXC0S	1.001	Not Tested

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12 EC Declaration of Conformity CE-Marking

NTI AG / *LinMot* ®
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declares under sole responsibility the compliance of the products:

Servo Drives of the Series C14x0-xx-VC-0S-xxx

with the

Low Voltag Directive 2006/95/EC

Applied harmonized standard:

EN 61800-5-1: 2007

Year of affixing the CE marking in accordance with the EC Low Voltage Directive:

2014

EMC Directive 2004/108/EC

Applied harmonized standards:

EN 61000-6-2: 2005 (Immunity for industrial environments)

EN 61000-6-4: 2007 (Emission for industrial environments)

According to the EMC directive, the listed devices are not independently operable products.

Compliance of the directive requires the correct installation of the product, the observance of specific installation guides and product documentation. This was tested on specific system configurations.

The safety instructions of the manuals are to be considered.

These products are intended for installation in machines. Operation is prohibited until it has been determined that the machines in which these products are to be installed, conforms to the above mentioned EC directive.

The product must be mounted and used in strict accordance with the installation instructions contained within the installation guide, a copy of which may be obtained from NTI AG.

Company: NTI AG
Spreitenbach, March 13, 2014

Dr. Ronald Rohner / CEO NTI AG

Dr. Marco Hitz / Responsible for documentation

13 Contact Addresses

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Please visit http://www.linmot.com/ to find the distributor closest to you.

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